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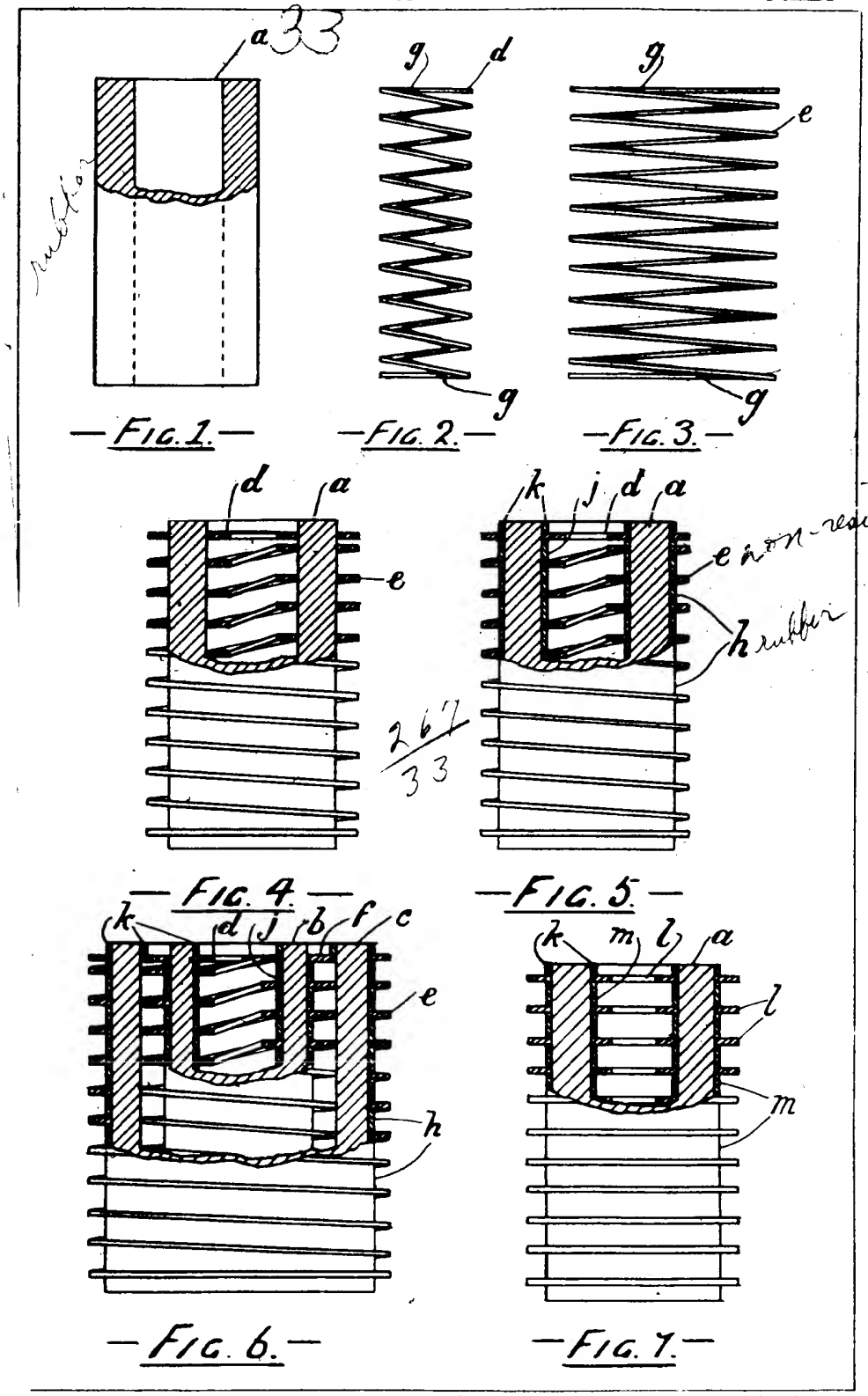
229,057 COMPLETE SPECIFICATION Feb 19, 1925 1 SHEET



—FIG. 1.— —FIG. 2.— —FIG. 3.—

—FIG. 4.— —FIG. 5.—

—FIG. 6.— —FIG. 7.—

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cylinders for a two cylinder concentric cylinder spring, *d* indicates inner and *e* outer coils of strip steel, *f* is an intermediate coil of similar material fitted between two concentric cylinders, *g* shews a method of fastening the end of the strip steel to its adjacent turn by brazing or welding to form a ring at each end of a coil, *h* indicates the strip of rubber wound between the turns of the outer coils and *j* a similar strip of rubber fitted between the turns of the inner coils, *k* shews the separate strips or rings of rubber secured to that part of the rubber cylinders which project beyond the ends of the coils, *l* shews the alternative arrangement of a series of separate steel rings which may be used instead of the coils and *m* the separate strips or rings of rubber fitted between each two steel rings to keep them in their correct relative positions on or in the cylinders.

From the foregoing description it will be readily understood that the india rubber single or concentric cylinders take the place of the india rubber single or concentric rings and the coils or their equivalent the place of the dividing plates or washers used in the existing types of india rubber springs of the kind previously referred to.

For certain purposes a spring may be formed as above in which the india rubber cylinder is solid or in which, when two or more cylinders are used to form the spring, the inner cylinder is solid.

Further the springs may be made of cylinders other than circular for instance, they may be oval and fitted with oval coils or rings to suit, or again, the springs may be of india rubber hollow or solid prisms of any suitable shape such as square or rectangular and fitted with coils or rings to suit.

If desired two or more springs may be placed end to end to form a spring of the required length and the, in that case, part springs may be of any desired length to suit the conditions which make this arrangement necessary.

Further, I wish it to be distinctly understood that my invention is not limited to the particular arrangements described but that any combination of the above arrangements may be used for the purpose specified without departing from the invention.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. An india rubber spring for shock absorbing purposes formed of a hollow india rubber cylinder or prism fitted both inside and outside with a coil of steel or other suitable material which coil is non-resilient, the shock absorbing properties of the spring being due solely to the rubber cylinder or prism, substantially as described.

2. An india rubber spring for shock absorbing purposes in which two or more india rubber hollow cylinders or prisms are arranged concentrically and fitted with coils of steel or other suitable material inside the inner cylinder, outside the outer cylinder and between each two cylinders, said coils being non-resilient, the shock absorbing properties of the spring being due solely to the rubber cylinders or prisms, substantially as described.

3. An india rubber spring for shock absorbing purposes according to Claims 1 or 2 in which a strip of india rubber is wound or fitted between the turns of each coil and cemented or otherwise joined to the rubber cylinders or prisms to keep the turns of the coils in or on the cylinders or prisms in correct relative position, substantially as described.

4. An india rubber spring for shock absorbing purposes according to Claims 1 or 2 and 3 in which the cross section of the india rubber part is oval, square, rectangular or any other suitable shape and fitted with coils to suit, substantially as described.

5. An india rubber spring for shock absorbing purposes according to Claims 1 or 2, 3 and 4 in which one or more series of separate rings of steel or other suitable material are used instead of one or more of the coils, the said rings being positively retained in correct relative position and in which the sole means of retaining the said rings in their correct position is strips or rings of india rubber fitted and secured between each two of the metal rings, substantially as described.

6. A modification of the india rubber spring for shock absorbing purposes according to Claims 1, 2, 3, 4 or 5 in which the india rubber cylinder or prism is solid or in which, when the spring is formed of concentrically arranged cylinders or prisms, the inner cylinder or prism is solid, substantially as described.

7. India rubber springs for shock absorbing purposes constructed, arranged and operating substantially as described and with reference to the accompanying drawings and for the purposes specified.

Dated the 6th day of October, 1924.

ALBERT BULBICK.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1925.

PATENT SPECIFICATION

Application Date: Jan. 8, 1924. No. 484/24.

,, ,, Sept. 23, 1924. No. 22,398/24.

One Complete Left: Oct. 7, 1924.

Complete Accepted: Feb. 19, 1925.

229,057

PROVISIONAL SPECIFICATION.

No. 484, A.D. 1924.

India Rubber Springs.

I, ALBERT BULBICK, of 76, The Crescent, Eastleigh, Hants, a British subject, do hereby declare the nature of this invention to be as follows:—

My invention comprises improvements in india rubber springs such as are used for the buffing and drawgear of railway vehicles and for other shock absorbing purposes. The springs referred to are usually threaded and work on a rod or spindle and are built up of india rubber single or concentric rings arranged alternately with dividing plates to make a spring of the required length.

The object of this invention is to provide a spring which will be less costly to produce and which will retain all the spring-like qualities of the existing types.

According to this invention the india rubber part of the spring is made in the form of a hollow cylinder of the required length, the wall of the cylinder being of a suitable thickness for the purpose in view. The outside of this india rubber hollow cylinder is fitted, as though wound, with a coil of wire or strip material, preferably steel, of suitable cross section. The turns of this coil are suitably spaced so that when the spring is under load or compression the india rubber may bulge only between the turns of the coil and at the same time be prevented from bulging where held by these "turns".

The inside of the india rubber hollow cylinder is also fitted with a similar coil, the turns of which are preferably spaced the same as and arranged opposite those on the outside, this inner coil besides providing space between its turns for the bulging of the rubber also acts as a bearing or a wearing surface against the rod or spindle on which the spring is working and thus prevents the rubber chafing or rubbing against it.

If desired a spring may be formed of two or more hollow india rubber cylinders arranged concentrically with the smaller inside the larger and with a suitable wire or strip coil fitted between each two, inside the inner and outside the outer, so that when fitted together the various parts form a compact whole. In this case the coils between each two india rubber cylinders provide, between their turns, the necessary space for the bulging of the rubber when under load and also act as distance pieces to keep each cylinder in its correct relative position.

The coils are preferably finished at each end by joining the ends of the wire or strip material to the adjacent turn, thus forming a ring, by welding, brazing or any suitable means.

The coils hereinbefore referred to may be fitted to and held in position on the india rubber during the moulding process or by any suitable means but preferably the coils are mounted in jigs and forced into place in or on the india rubber cylinders, the india rubber, if desired, being distorted by stretching or otherwise to facilitate this.

If desired the outer coil of wire or strip material may be dispensed with altogether or a series of rings suitably spaced may be substituted for it, or again, both inner and outer coils may be dispensed with and series of metal rings fitted instead.

Further for certain purposes springs may be formed as above but in which the india rubber cylinder is solid or in which when two or more cylinders are used to form a spring, the inner cylinder is solid.

If desired the india rubber cylinders may be formed with grooves in their surfaces or otherwise shaped or arranged to hold the coils, or rings if such are used, in position.

In some cases it may be preferable to make these springs, or in such cases "part springs", of such lengths that two or more placed end to end are required to make springs of the necessary length.

Further, any modification or combination of the hereinbefore mentioned arrangements may be used for the purposes specified without departing from the invention.

Dated the 7th day of January, 1924.

ALBERT BULBICK.

PROVISIONAL SPECIFICATION.

No. 22,398, A.D. 1924.

India Rubber Springs.

I, ALBERT BULBICK, 76, The Crescent, Eastleigh, Hants, a British subject, do hereby declare the nature of this invention to be as follows:—

In a prior Application for Patent No. 484 of 8th January, 1924, I have set forth improvements in india rubber springs such as are used for buffing and draw-gear of railway vehicles and for other shock absorbing purposes. The springs referred to are usually threaded and work on a rod or spindle and are built up of india rubber single or concentric rings arranged alternately with dividing plates or washers to make up a spring of the required length.

The object of the invention is to provide a spring which will be less costly to produce and which will retain all the spring-like qualities of the existing types.

The invention of my said prior application comprised hollow india rubber cylinder or cylinders the outside and inside being fitted, as though wound, each with a coil of wire or strip material of suitable cross section, preferably steel, the turns of the coils being suitably spaced for the purpose in view.

While still preserving all the general features of the india rubber cylinders and the coils of wire or strip material or, alternatively, the series of rings, referred to in the previous application for patent, the present improvement provides an alternative method of retaining the turns of the coils or their equivalent in position on or in the india rubber cylinders.

According to this improvement, after the coil has been fitted on the india rubber cylinder a strip of india rubber of suitable thickness and a little greater in width than the distance between the turns of the coil is wound round the rubber cylinder between the turns of the coil and, owing to its being wider than the space in which it must fit, forced between the turns by pressure or by stretching to reduce its width and then permitting it to settle tightly between the turns. This india rubber strip is secured to the cylinder by cementing or otherwise along its whole length.

To finish off the ends of the spring another strip or a ring of rubber of suitable dimensions is fitted and secured to the ends of the cylinder which project beyond the ends of the coil.

The coil which is fitted inside a single cylinder spring or in the inner cylinder of a concentric cylinder spring is preferably retained in position in the same way.

In the case of springs formed of two or more india rubber hollow cylinders arranged concentrically the inner and outer coils are secured in position as stated above whilst the coil or coils between two cylinders are preferably held in place on the inner cylinder by a long india rubber strip wound between its turns and by a ring or strip of rubber secured to the outer cylinder where the cylinder projects beyond the coil at each end.

The ends of the rubber strips wound between the turns of the coils are preferably tapered at each end to suit and fit between the end turns of the coils and to make a neat job.

If desired the thickness of the walls of the cylinders when made may be reduced by an amount equal to the thickness of the rubber strips since these strips, when in position, are cemented to and preferably vulcanised in one with the cylinder and thus compensates for the reduction of the cylinder walls.

When a series of rings are used instead of coils they may be retained in position by fitting and securing separate strips or rings of india rubber between each two rings, the ends of the spring being finished as previously herein mentioned.

Further it should be distinctly understood that the springs may be made up of india rubber hollow or solid prisms of any suitable cross section instead of cylinders if desired without departing from the invention.

Dated the 22nd day of September, 1924.

ALBERT BULBICK.

COMPLETE SPECIFICATION.

India Rubber Springs.

I, ALBERT BULBICK, 76, The Crescent, Eastleigh, Hants, a British subject, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

My invention comprises improvements in india rubber springs such as are used for the buffing and drawgear of railway vehicles and for other shock absorbing purposes. The springs referred to are usually threaded and work on a rod or spindle and are built up of india rubber single or concentric rings arranged alternately with dividing plates or washers to make a spring of the required length.

The object of this invention is to provide a spring which will be less costly to produce and which will retain all the spring-like qualities of the existing types.

According to the invention the india-rubber part of the spring is made in the form of a hollow cylinder of the required length, the wall of the cylinder being of a suitable thickness for the purpose in view. The outside of this india rubber hollow cylinder is fitted, as though wound, with a coil of wire or strip material, preferably steel, of suitable cross section, the turns of the coil being suitably spaced so that when the spring is under load or compression the india rubber may bulge only between the turns of the coil and at the same time be prevented from bulging where held by these turns.

The inside of the india rubber cylinder is also fitted with a similar coil the turns of which are preferably spaced the same as and arranged opposite those of the larger coil on the outside of the cylinder, this inner coil besides providing space for the bulging of the rubber between its turns also acts as a bearing or a wearing surface against the rod or spindle on which the spring is working and thus prevents the india rubber rubbing or chafing against it.

If desired a spring may be formed of two or more india rubber hollow cylinders of suitable sizes arranged concentrically with the smaller inside the larger and with a suitable wire or strip coil fitted between each two cylinders inside the inner and outside the outer cylinder so that when fitted together the resultant spring forms a compact whole. In the case of springs formed of concentric cylinders in this way the coils between each two india rubber cylinders provide, between their turns, the necessary space for the bulging of the rubber when under load and also act as a distance piece to keep each cylinder in its correct relative position.

The coils are preferably finished at each end by joining the ends of the wire or strip material to the adjacent turn, thus forming a ring, by welding, brazing or any suitable means.

I wish it to be distinctly understood that the metal coils referred to are not coil springs and are not designed or intended to exert any spring-like force or resistance. The spring-like qualities of the complete spring being entirely due to the india rubber only. The coils, of which there must be both inner and outer with hollow cylinders together with intermediate coils when hollow concentric cylinders are employed, are used to prevent the rubber bulging throughout its whole length when the spring is under load, to permit its bulging between the turns of the coils only and as annular distance pieces between two concentric cylinders or between a cylinder and its rod or spindle, thus, when a spring is under load the material of the outer coil is under tension, that of the inner coil under compression whilst an intermediate coil between two concentric cylinders would be subjected to both tension and compression stresses. All the coils would, of course, be subjected to more or less slight torsional stresses, but if any spring-like force or resistance was exerted by them it would be so small as to be negligible owing to the comparatively small cross sectional area of the [illegible].

The coils hereinbefore referred to may be fitted to and held in position on the india rubber during the moulding process or by any suitable means or the coils may be mounted in jigs and forced into place in or on the india rubber cylinders, the india rubber, if desired, being distorted by stretching or otherwise to facilitate this.

Alternatively and preferably the coils are retained and held in correct position and form on or in the india rubber cylinders by additional strips and, in some cases, rings of suitable quality rubber cemented to the cylinder between the turns of the coils as described below.

After a coil has been fitted on its india rubber cylinder a strip of india rubber of suitable quality and thickness or

section and preferably a little greater in width than the distance between the turns of the coil is wound around the rubber cylinder between the turns of the coil and, owing to its being wider than the space in which it must fit, pushed or forced between the turns by pressure or by stretching to reduce its width and then permitting it to contract and settle tightly between the turns. This india rubber strip is secured to the cylinders by cementing or otherwise. The ends of the rubber strips wound between the turns of the coils should be tapered at each end to suit and fit properly between the end turns of the coils and to make a neat finish.

To finish off the ends of the spring and help secure the coil in place another strip or a ring of india rubber of suitable dimensions is fitted and secured to the ends of the cylinder which project beyond the ends of the coil.

The coil which is fitted inside a single cylinder spring or in the inner cylinder of a concentric cylinder spring is preferably retained in position by means of a strip of rubber secured to the cylinder between the turns of the coil in the same way.

In the case of springs formed of two or more india rubber hollow cylinders arranged concentrically the inner and outer coils of the spring are secured in position as described above whilst each coil between two cylinders is preferably held in its place between the cylinders by means of a long india rubber strip wound on and secured to its inner cylinder between the turns of the coil and by a ring or strip of rubber secured to its outer cylinder where that cylinder projects beyond the coil at each end.

The result of the addition of these strips and rings of rubber is that each of the coils is now fitted in a shallow spiral groove in the cylinder walls, the grooves being of such a depth that the turns of the coils are safely held in their correct positions on or in the cylinders.

Preferably the thickness of the walls of the cylinders when made are reduced by an amount equal to the thickness of the rubber strips or rings to be applied since these strips or rings when in position are cemented to and preferably vulcanised in one with the cylinder walls and compensate for this reduction.

If desired a series of steel or other suitable rings of suitable cross section may be pressed or fitted either inside or outside the hereinbefore mentioned hollow india rubber cylinders or between two concentric cylinders instead of the coil or coils of wire or strip material and in such cases I wish it to be distinctly understood that the said india rubber cylinders are not formed with grooves or recesses in, or projections on their curved surfaces for the reception and positioning of the metal rings, as it has been found in practice that this method of fitting the rings is not satisfactory since the rings soon get loose under working conditions and become useless for the purpose in view. This fault has also been found in cases where metal rings have been pressed on or fitted to india rubber cylinders without a positive retaining means to keep the rings in their correct positions. Further it should be understood that the said metal rings are not embedded in the cylinders in any way, either in the moulding process or by any other means.

According to this invention the metal rings are equally spaced throughout the length of the india rubber cylinders in a similar manner to the turns of the previously referred to coils and the rings, after being fitted to or in the cylinders, are retained in position by fitting and securing separate strips or rings of india rubber, to the rubber cylinder, between each two metal rings, the rubber rings or strips to be of suitable width and thickness for the purpose in view. The same method is used for securing the rings between two concentric cylinders, and the ends of the springs are finished off as previously described for springs fitted with coils of wire or strip material.

The accompanying drawings illustrate the invention.

Fig. 1 is a part sectional view of an india rubber cylinder suitable for a single cylinder spring.

Fig. 2 is a coil of strip steel for use as described inside the cylinder.

Fig. 3 is a coil made of similar material for use outside the cylinder.

Fig. 4 is a part sectional view of the cylinder and the two coils assembled to make a spring.

Fig. 5 is a part sectional view of a similar spring to that shewn in Fig. 4 but in which the coils are held in position by means of strips of india rubber wound between the turns of the coils.

Fig. 6 is a part sectional view of a spring made up of two cylinders arranged concentrically.

Fig. 7 is a part sectional view of a single cylinder spring in which two series of steel rings are used instead of coils the rings being retained in position by strips or rings of india rubber secured between each two steel rings.

In the drawing *a* indicates india rubber cylinders for single cylinder springs, *b* is the inner and *c* the outer rubber